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ABSTRACT

Both humanity and nature have suffered greatly from human insensitivity. Not only are the natural resources of the earth being depleted and its air, land and water polluted, the financial resources of humanity are being wasted on destructive expenditures. The "Our Only Earth" series is an integrated science, language arts, and social studies problem solving program for grades 4-12 that addresses six different global issues. The units are designed to provide students with knowledge and skills to address these major global issues actively. The unit presented in this document addresses the problems associated with the global effects of atmospheric pollution. This document includes information to assist teachers in organizing and directing students in their activities. This teacher's guide includes a unit overview, instructions on how to collect information through letter writing (including addresses for appropriate organizations), four classroom activities, a set of fact cards, instructions for a scavenger hunt, instructions for a geography activity, instructions for research and independent study, and materials for a youth summit on global air pollution. Additional materials included in this packet are a discussion and chart of instructional techniques and thinking skills used in the unit, a glossary of terms and a bibliography of 38 books, articles, other resources, and games on atmospheric pollution. (CW)

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OUR ONLY EARTH SERIES

Our Troubled Skies

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A CURRICULUM FOR GLOBAL PROBLEM SOLVING.

ONE OF A SERIES.

ZEPHYR PRESS

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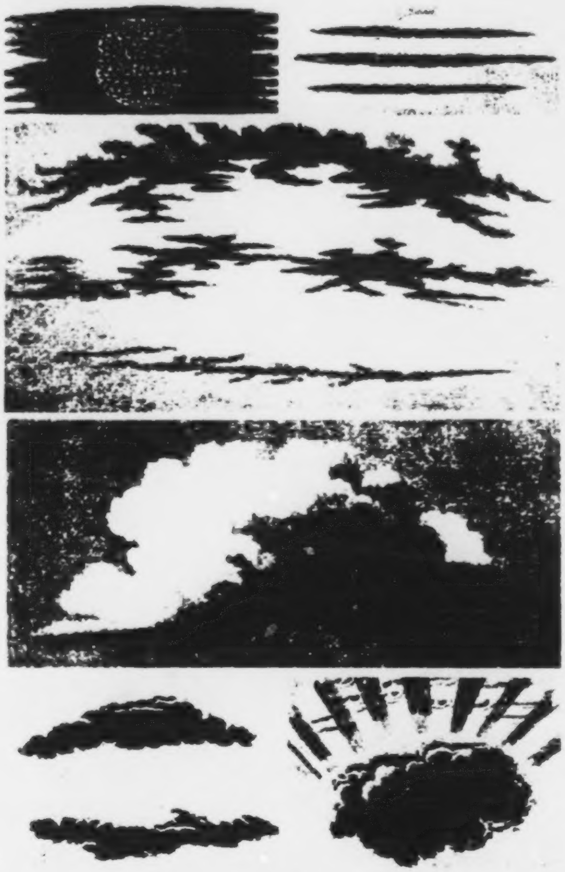
A CURRICULUM FOR GLOBAL PROBLEM SOLVING

Our Troubled Skies



An integrated curriculum that explores real life issues, culminating with a SUMMIT where students seek solutions to global problems and create action plans. This versatile program is ideal for grades 4th–12th, or as a format for community and regional forums.

Our Troubled Skies

The Future of Our Tropical Rainforests

Our Divided World: Poverty, Hunger & Overpopulation

War: The Global Battlefield

Endangered Species: Their Struggle to Survive

The Ocean Crisis

By LINDA MacRAE-CAMPBELL and MICKI McKISSON

OUR ONLY EARTH

A CURRICULUM FOR GLOBAL PROBLEM SOLVING

Our Troubled Skies

- One in a Series of Six Non-Sequential Units
- For Grades 4-12 • Small or Large Groups
- One Month to One Year Course of Study
- Each Unit Follows the Same Format

Our Troubled Skies
The Future of Our Tropical Rainforests
Our Divided World: Poverty, Hunger & Overpopulation
Endangered Species: Their Struggle to Survive
War: The Global Battlefield
The Ocean Crisis

Zephyr Press • Tucson, Arizona

By LINDA MacRAE-CAMPBELL and MICKI McKISSON

Dedicated to Our Common Mother—
Our Beloved and Only Earth

> *" . . . The earth does not belong to man: man belongs to the earth. This we know: all things are connected. Whatever befalls the earth, befalls the sons of the earth. Man did not weave the web of life. He is merely a strand in it. Whatever he does to the web, he does to himself."*
>
> **Chief Noah Sealth, 1854**

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Note: Every *teacher information* section gives an explanation to the corresponding reproducible student activity.

Our Only Earth Series

The Chinese ideograph for the word *crisis* is made up of two words: danger and opportunity. Currently, there are many threatening global issues and diverse opinions as to how to address them. For example, Noel Brown, director of the United Nations Environmental Program, urges immediate action, stating that the earth has approximately 4000 days before it is irreparably polluted. Another view, held by physicist and author F. David Peat, states that individuals need to learn to think systemically and reflectively before taking action.

It should be noted that the intent of the *Our Only Earth* materials is to provide students with knowledge and skills to actively address major global issues. We feel that exciting opportunities exist for resolving pressing social and environmental problems when students are educated about real-life issues, have the tools to address them, and have the desire to act to improve the lives of others and the health of the planet.

Humanity and the environment have suffered greatly from our own insensitivity. To insure our survival and the survival of all forms of life, it is necessary to establish an ethical relationship with others and the planet we share.

Our Only Earth is an integrated science, language arts, and social studies problem-solving program consisting of eight classroom activities. Each of the units in the series follows the same format. These activities can extend from one month of study to an on-going year-long process. Students enthusiastically embrace the lessons because the instructional strategies are so varied and appeal to learners of all ages and types.

Students enjoy the *Our Only Earth* series also because real-life issues are addressed and solutions proposed. This program provides information which is aimed at strengthening students' skills, enabling them to contribute positively to their world.

Introduction

Both humanity and Mother Earth have suffered greatly from human insensitivity. Not only are we rapidly depleting the planet's resources and polluting its air, land, and water, we also waste our financial resources on destructive expenditures. Current global trends reveal the unhealthiness of our planet and our priorities:

- According to Dr. Norman Myers, one species a day is becoming extinct. This rate is expected to accelerate to one species every 15 minutes by the year 2000.

- Myers also states that every year 40 million people die from starvation and hunger-related diseases, half of them children. This is equivalent to more than 300 jumbo jet crashes every day.

- Tropical rain forests comprise only 8% of the earth's surface but contain 40% to 50% of all known species of life. Tropical forests play an important role in regulating global climate and provide an abundance of resources to all of humanity. Yet, according to Walter Corson, if present trends continue, most of the world's tropical forests will be gone by the year 2000.

- Scientists predict that various forms of air pollution may cause global temperatures to rise, the oceans to expand and flood coastal lowlands, interrupting natural food chains, and cause widespread skin cancer among humans.

- According to Lester Brown, in 1988 the world spent more than $100 million each hour on global military expenditures.

- A 1988 article in *Nature Scope* explains that every year fourteen billion pounds of trash are dumped into the oceans. Oil spills, industrial waste, agricultural chemicals, and human pollution relentlessly choke our oceans and marine life.

These statistics are frightening and depressing. When we first began to develop this global education program, we were shocked at the dilapidating state of our planet. We grew apprehensive over the increasing potential for devastation were these problems allowed to escalate. All in all, the prospects seemed dim. Yet, in watching students tackle these monumental global issues—overwhelming to us—our hope was restored. Students, fourth through twelfth grade, once acquainted with this program, developed solid action plans addressing the major global challenges of today.

A few of the students' recent solutions include:

- creating an Animal Congress for animal rights.
- drafting the *Youth Declaration for the Future* which requests that governmental priority be given to global issues
- writing letters protesting deforestation
- adopting a humpback whale
- developing church, school, and community forums
- writing letters to newspapers about global concerns
- picking up litter at parks and beaches

Our fears were quelled by hope as students grew confident in their ability to make a difference in their world, for their world. A seventh grade girl named Emma Wilson stated:

> *"These problems have been left to us. We are the ones who will make a difference. We are the future and we do care."*

Your students will also gain knowledge about a particular area of global concern; they will learn a problem-solving process that addresses an issue of great magnitude and ideally, they will be roused to action. The legacy of a polluted environment with crippling social problems will be inherited by our students, who, with help from the *Our Only Earth* series, will gain the knowledge, skills, and hopefully, the desire to appropriately care for our Earth. All kingdoms of life will benefit.

Note: Sources for the facts mentioned on the previous page can be found in the bibliography.

Various Instructional Techniques

Not only are the global topics timely and important, but they will incite enthusiasm in your students. The activities, developed by award-winning teachers and field-tested by elementary and secondary students, are first and foremost FUN! Students will enjoy the dynamic and varied learning activities. You, as the instructor, will appreciate the care and thoroughness that went into the preparation of these lessons for use in your classroom.

A variety of instructional strategies are used in classroom activities in order to appeal to all types of learners. Several concrete and experiential learning processes engage the bodies, minds, and feelings of students. Kinesthetic, visual, and auditory functions are stimulated to maximize the learning potential of each student. The lessons provide opportunities for them to work independently as well as cooperatively in small and large groups. Critical and creative thinking skills are incorporated into the activities to engage students in higher levels of thinking. A creative problem-solving stategy is implemented to help students approach the issues at hand. The chart on the following page depicts the variety of instructional strategies and higher level thinking skills which are included in *Our Only Earth* activities.

INSTRUCTIONAL STRATEGIES & THINKING SKILLS IN *OUR ONLY EARTH*

	Overview	Letter Writing	Classroom Activities	Accelerated, Cooperative Learning: Nothing but the Facts	Scavenger Hunt	Where in the World Map Activity	Self-Directed Learning	Global Problem Solving: The Summit
Learning-to-Learn Skills	X	X			X	X	X	X
Memory Skills	X			X				X
Kinesthetic Activites			X	X	X		X	X
Visual Activities	X		X	X	X	X	X	X
Creative Thinking Skills	X		X	X	X		X	X
Critical Thinking Skills	X	X	X	X	X	X	X	X
Problem Solving		X		X	X	X	X	X
Cooperative Learning	X			X	X	X		X
Research Skills	X	X	X	X	X	X	X	X
Communication Skills	X	X		X	X	X	X	X
Engaging Feelings	X		X					X

In addition to a variety of instructional strategies, the enclosed lessons also provide an integrated learning experience which incorporates science, language arts, social studies, and thinking skills. The following chart shows the integration between subject matter and lessons and activities of *Our Only Earth:*

- SCIENCE
  - Overview
  - Classroom Activities
  - Fact Cards
  - Scavenger Hunt
  - Research
- LANGUAGE ARTS
  - Overview
  - Letter Writing
  - Scavenger Hunt
  - Research
  - Independent Study Contract
- SOCIAL STUDIES
  - Overview
  - Classroom Activities
  - Fact Cards
  - Scavenger Hunt
  - Research
  - Map Activity
- THINKING SKILLS
  - Overview
  - Scavenger Hunt
  - Research
  - Youth Summit—all processes

The Sequence of Our Only Earth

Our Only Earth has been carefully structured for both the student and the teacher. Study of the global problem begins with a brief survey, followed by in-depth information and independent research, culminating with a problem-solving process where students conduct their own Youth Summit. At the Summit, the students search for solutions and create action plans to approach the global issues.

In the Teacher's Guide, you'll note explanations for each student activity. The lessons in *Our Only Earth* are intended to be used as guidelines. Your creativity is encouraged, so please use these materials as a springboard for developing your own classroom activities.

The Overview

The students begin with an Overview of the issue. The Overview serves as a quick appraisal of the global issue and discloses important facts as to WHY this topic is worthy of study. Since the Overview shares poignant information, the students often become emotionally engaged in the topic. If students feel overwhelmed or fearful, as we initially did, reinforce the point of studying this issue—to improve environmental or social conditions. To do this, it is necessary to be informed.

Letter Writing

Next, students will write letters to organizations requesting information about the particular global problem at hand. This activity serves two main purposes: to introduce students to formal letter writing, and to provide them with up-to-date information on the topic.

Classroom Activities

Students, as a class, will then have hands-on experience to personally explore aspects of the global issue. Because of the experiential nature of these activities, the students should be motivated to study further for the next activity.

Nothing But The Facts!

This is a cooperative and accelerated learning activity that teaches facts and information about global problems. Students are divided into small groups. Everyone receives a fact card and teaches the three facts on the card to their group. Next, the group prepares a dynamic mini-presentation to teach their facts to the whole class. When this lesson is complete, the students will have learned a wealth of information about their global challenge.

Scavenger Hunt

Prepare for your students to go wild with excitement over this activity! The students will be gathering additional information on their topic through a scavenger hunt method. Again, the students will work in small groups and then share the data they have gathered with the whole class.

Where In The World.........?

This is an enjoyable map activity. Students locate acute problem spots on a world map, pinpoint the coordinates, and identify the regional areas involved.

Research and Independent Study Contract

Now that your students have gathered an abundance of information, they are ready to identify one aspect of the problem and pursue it through independent research. To help facilitate this individualized research, each student will complete a contract. You will then be able to log each student's progress, as well as help your class move towards the most valuable type of educational experience—self-directed learning.

The Youth Summit

Here the students will actively meet in groups to share what they have learned, to decide upon a specific problem they want to solve, and to create a plan of action. This problem-solving process is the highlight of the entire unit. At the Summit, students are asked to make positive contributions to the world. Activating the students' plans may, for some, take a short period of time, or in other cases, depending on the particular commitment, may take longer.

As your students progress through *Our Only Earth*, you will undoubtedly notice many significant attitude changes. They grow aware of the delicate global environment we live in. They develop a sense of responsibility towards others. Often there is a commitment to become a caretaker for the planet. Here is what some students have to say after participating in *Our Only Earth* Programs:

"We are the ones doing this to ourselves and we can learn to stop."
Sue Ann Martin, age 11

"I learned that I am not the only one out there who cares and that I have something to do for this polluted but wonderful world."
Misty Vichitnand, age 12

"After studying these problems, I learned to be more caring for the world. I see that we can be world changers."
Jason Schmidt, age 9

Note: As you photocopy activities for your students, remember that copier paper can be recycled too!

1 The Overview

Suggested Activities for the Global Issue Overview

(approximate time: 1 hour)

The Overview contains interesting information on your global challenge and will ready students for more in-depth information. The intent of the Overview is to provide your class with a quick survey of the main issues while piquing their curiosity and their desire to learn more.

One way to introduce students to the Overview is to first have them quickly brainstorm what they already know about the topic. They can do this individually or as a group. You may want to list or chart their information on the blackboard. Another option would be to list the information on an overhead sheet or on a piece of butcher paper so that students can refer back to their original suggestions and then add new information when needed.

Copies of the Overview are distributed after the discussion. Suggest your class read silently through the material once to pick up general information. For the second reading, have students note at least three facts that are particularly interesting to them. Ask the students to prepare to teach these three facts to a small group of students or to the whole class. Suggest they make visuals, a riddle, or a short poem to help teach the others. Give the students about fifteen minutes to prepare.

After the students have shared their three facts, ask the class for additional questions they might have about the global issue. You may want to suggest they consider questions asking **who, what, where, when, why and how.** As the students begin to share their questions, you may want to list them on the board or on a piece of butcher paper for future reference. Later, as the students progress through their studies, they may want to note answers they have found to their questions.

Overview of Air Pollution

The Earth's atmosphere was probably formed billions of years ago with the origin of the planet. The term "atmosphere" refers to the envelope of air that surrounds the Earth. Throughout time, the atmosphere has changed. However, during the last 200 years, the rate of change has increased dramatically. This rapid change is due to human activity.

The atmosphere naturally contains large amounts of nitrogen, oxygen and other gases. These gases have been constant and stable since long before humanity inhabited the planet. The earth's atmoshere also contains smaller quantities of trace gases such as sulfur dioxide, nitrogen oxides and chlorofluorocarbons (CFC's). Human beings have been spewing millions of tons of these trace gases into the atmosphere, causing air pollution.

There are four main types of air pollution:

acid rain
smog
depletion of the ozone layer
increased greenhouse gases

Each form of air pollution is damaging the environment and human life as well.

Acid rain is produced by the release of sulfur and nitrogen oxides. These gases are emitted from the burning of fossil fuels which include wood, coal, gas and oil. Motor vehicles, power plants and industries release pollutants that form acid rain. Acid rain is very destructive: it kills fish in lakes and streams, destroys forests, damages commercial crops, and harms wildlife. Acid rain harms humans as well by increasing the amount of asthma, lung, heart and brain disease.

Smoke-filled air hangs over most cities in unhealthy shades of brown, yellow or gray. **Smog**, another form of air pollution, frequently plagues large cities. Smog is created by combining solar radiation with gases from car exhaust and industry. Smog is responsible for damaging and killing plants, crops and forests. It also erodes buildings and monuments. In humans, smog causes eye irritation and can impair breathing. In the past 50 years, smogs in Pennsylvania and Japan were so poisonous that they resulted in many deaths.

Another kind of air pollution is caused by the release of chemicals called chlorofluorocarbons (CFC's). CFC's are used in aerosol sprays, refrigerators, air conditioners, styrofoam and solvents. These chemicals rise in the air and **damage the protective ozone layer** that normally shields the Earth from the harmful ultraviolet rays of the sun. Ultraviolet light damages plants and animals and can cause skin cancer. Scientists say that the thinning of the ozone layer has a negative impact on all people around the world. The increased amount of ultraviolet light harms the human immune system, decreases the body's resistance to disease and increases its chances of developing infections and tumors. More occurrences of cataracts, clouding of the eye lens, could result and plants and crops could be damaged as well.

Many current magazines, newspapers and television shows are discussing the **"greenhouse effect"**. This is a natural phenomenon that happens when gases in the atmosphere trap heat which is reflected from the Earth. This warming effect allows life to exist on the planet. However, greenhouse gases have greatly increased due to the burning of fossil fuels and the release of CFC's as well as other gases. Some scientists claim that these additional greenhouse gases are expected to increase global temperatures which could alter world climates, raise sea levels, drown coastal areas and change agricultural production. The changes in climate could be so rapid, possibly within a single generation, that countries may not be able to adjust quickly enough to effectively cope with the problem. Many plant and animal species are expected to become extinct since they will not be able to adapt quickly enough to survive.

By treating our skies like dustbins, humankind has created many hazardous forms of air pollution. It's necessary that we begin reducing or eliminating the production of dangerous trace gases. All people everywhere must find ways to clean our troubled skies. The health of the planet is at stake. Humans, plants and animals all need a breath of fresh air.

2 Letter Writing

Writing to Organizations for Information

(approximate time: 1 hour)

In order to gather current information on the global challenge, you will want to initiate a letter-writing activity to various organizations at the beginning of the unit. It often takes four to six weeks to receive information. However, the wait is well worth it, as the materials will provide relevant and up-to-date information. For a quicker response, depending upon your locality, you can also call organizations and ask them to send information.

To introduce this letter-writing activity, ask the class to consider questions they have about the issue at hand. Explain that writing letters to public and private organizations is an effective way of gathering information on a topic where data is continually changing.

Begin by providing students with copies of "Organizations to Write to for Information." Brainstorm with them about what elements to include in a letter that requests information. Assign groups, pairs, or individual students to contact an organization. You may want to suggest that they create an outline before writing. It's important for students to be specific in their requests for materials. Depending upon the age and ability level of your students, you may wish to format a sample letter.

Expect an abundance of information from these organizations.

Organizations to Write to for Information on Air Pollution

ENVIRONMENTAL PROTECTION AGENCY
Office of Research and Development
RD-672
401 M Street, S.W.
Washington, DC 20460
(202) 382-7676

GLOBAL TOMORROW COALITION
1325 G Street, N.W., Suite 915
Washington, DC 20005-3104
(202) 628-4016

GREENPEACE USA
1436 U Street, N.W.
Washington, DC 20009
(202) 462-1177

NATIONAL CLEAN AIR COALITION
1400 16th Street, N.W.
Washington, DC 20036
(202) 797-5463

NATURAL RESOURCES DEFENSE COUNCIL
40 W. 20th Street
New York, NY 10168
(212) 949-0049

Note: Because these organizations may move before our annual Spring update, please see the *Encyclopedia of Associations* for the most current addresses.

3 Classroom Activities:

Understanding the Problems of Air Pollution

In order to help students better understand the problems of air pollution, you may want to do one or more of the following activities with your class:

1. How Dirty is the Air Around You?

Materials needed:

- approximately 12 to 15 glass jars, one for every two students in the class
- several jars of petroleum jelly
- slips of paper cut to fit into the glass jars

Divide the students into pairs. Give each pair one jar and one slip of paper. Student pairs will need to share the jars of vaseline. Have the students smear their jars with petroleum jelly. The students should then locate a place around the outside of the school to place their jars. They should write the location of their jar on a slip of paper and insert it into the jar. After seven days, the students should bring their jars back into class. Each pair should examine their jars to see if any particles were collected and how many particles are visible. The students can then share their results with the rest of the class. Try to determine which location around the school has the dirtiest air.

2. Where Are the Sources of Air Pollution in Your Community?

Have the students draw a map of their local community or city. Locate on the map the major sources of air pollution in their area. Suggest that students note freeways and main highways, electrical power plants, dumping grounds, chemical plants and industrial centers. Have the students brainstorm other possible sources of air pollution to locate on their maps as well.

3. What Role Does Incomplete Combustion, Caused by Cars and Industry, Play in Contributing to Pollution in Our Society?

Materials needed: (for a class of 30 students)

- aproximately 15 candles
- approximately 15 pieces of glass or small mirrors
- matches
- tissues or paper towels

Divide the students into pairs. Give each pair one of the listed items. Have one student light the candle. While the candle is lit, have the other student hold the mirror or glass over the flame. Instruct the student holding the mirror to actually let it touch the flame for just a second. The mirror should then be quickly removed from the flame and the candle should be blown out. Have one student wipe the mirror clean. Notice the black on the tissue. This is carbon, the same carbon that is emitted from chimneys and cars. The mirror caught the carbon that was being emitted by the candle flame. Ask the students how pollutants such as carbon could be prevented from going into the atmosphere. (The use of filters for chimneys and catalytic converters for cars help reduce air pollution.)

4. How Much Does Car Exhaust Pollute Our Air?

The only material needed is a single coffee filter. Take the students out to where your car is parked and turn on the car. Have the students stand several feet from you while you hold the filter over the car's exhaust for about 15 seconds. Turn off the engine and then let the students examine the filter. Point out to the students that if this much dirt comes from just one car in 15 seconds, imagine how much pollution comes from millions of cars driving much longer than 15 seconds.

4 Fact Cards

Cooperative Learning With Fact Cards

On the following pages you will find fact cards about your global issue. What follows is a description of a cooperative learning activity that will, in one or two hours, introduce your students to a number of facts. Not only will the students cooperatively learn from each other, they will be exposed to a vast amount of material from this activity.

You will note that there are four categories of fact cards, each category with a total of eight cards, 32 in all. Divide your class into four groups of approximately eight students in each, or if you'd rather, divide them into approximately eight groups of four students each. Each group is then assigned one of the four categories to study.

After the categories are assigned and the student groups are physically arranged, each group then receives cards from one of the four categories. Each student takes one card which contains three facts. Students are then responsible for completing the following activities:

- Read the three facts on the cards. (approx. 5 minutes)
- Teach group members their three facts. (approx. 5-10 minutes)
- Learn the facts from the other group members. (approx. 5-10 minutes)
- Decide, as a group, on 8-14 facts to teach the rest of the class by preparing a class presentation. (approx. 20-30 minutes)
- Teach the group's facts to the other groups in the classroom so that all may learn from each other. (approx. 30-60 minutes)

When the students are teaching their facts to their own group and then to the rest of the class, they should be encouraged to be creative and interesting in their instruction. Inform the students that they can teach with the following methods:

- visuals, charts, diagrams
- poems, songs, or stories
- role play, games, or skits
- question-and-answer or riddle formats
- charades
- invent their own creative teaching strategies

Suggest to the students that they teach in ways that enable others to really learn the information, not just listen and forget!

When students are placed into their groups, some may wish to study another category. You can explain that when the activity is completed, everyone in the class will have learned about ALL of the topics. So even if they don't have their first choice, they will still have an opportunity to learn what interests them.

Age and Class Size Adjustment

It is easy to adjust the fact-card activity to fit a variety of age groups as well as a larger or smaller number of students. For fourth- through sixth-grade students, you may want to have them learn only one or two facts per card, then each group could teach fewer facts to the entire class. If you have fewer than 32 students, ask for volunteers who are willing to learn more than one card.

Evaluation of the Activity

Evaluation can occur in a variety of ways throughout this activity. Observing how students teach one another will indicate what was learned individually. Having the students list, draw, or reenact what they gleaned from their classmates will also demonstrate their knowledge. At the end of the presentations, you may want to ask students to list on paper at least ten facts they have learned.

Nothing but the Facts

AIR POLLUTION
GENERAL INFORMATION:

1. The word "atmosphere" refers to the entire envelope of air that surrounds the earth. The atmosphere and earth were probably formed at the same time.

2. Throughout time, the earth's atmosphere has changed frequently. However, the rate of change has increased during the last 200 years.

3. Human activities, such as how we produce energy, grow and harvest food and make consumer products are responsible for the rapid change in the atmosphere.

AIR POLLUTION
GENERAL INFORMATION:

1. Most of the gases in the atmosphere, such as nitrogen and oxygen, have remained at the same level since the beginning of humankind.

2. The atmosphere, however, also contains smaller quantities of trace gases such as sulfur dioxide, nitrogen oxides and chlorofluorocarbons (CFC's).

3. Humanity has spewed millions of tons of these trace gases into the air yearly. The increased quantities of trace gases cause many kinds of air pollution.

AIR POLLUTION
GENERAL INFORMATION:

1. Humanity has generated four types of air pollution: acid rain, smog, depletion of the ozone layer and the release of greenhouse gases.

2. Acid rain includes acid snow, wind, sleet, fog and dew and is created by the release of the trace gases sulfur and nitrogen oxides.

3. These trace gases are emitted from car exhaust, power plants, and mineral smelters.

AIR POLLUTION
GENERAL INFORMATION:

1. Acid rain, sleet, snow, and wind often travel great distances before being deposited. Acid rain is frequently generated in one country but deposited in another.

2. Acid rain causes billions of dollars of damage to land, crops, forests, lakes and marine life each year.

3. Acid rain is also destructive to buildings and monuments. It does billions of dollars of damage in the United States each year.

AIR POLLUTION GENERAL INFORMATION:

1. Another form of air pollution is urban smog, generally found in large cities. Smog is created by combining solar radiation with car and industry exhaust.

2. Smog harms humans by causing eye irritation and impairing breathing. Smog also damages plants, crops, and forests and erodes buildings and monuments.

3. Man-made ozone, mostly from car and industry exhaust, is damaging to living and non-living things. The levels of man-made ozone present in our atmosphere have more than doubled in the last 100 years.

AIR POLLUTION GENERAL INFORMATION:

1. The ozone layer is located about 10 to 20 miles above the earth. It is a protective shield that stops the harmful rays of the sun from harming life on earth.

2. Many consumer products contain chlorofluorocarbons (CFC's) which travel up into the atmosphere and damage the ozone layer.

3. Consumer products that contain CFC's include aerosol sprays, air conditioning and refrigerants, foam insulation, styrofoam and solvents for cleaning electrical parts.

AIR POLLUTION
GENERAL INFORMATION:

1. The naturally occurring "greenhouse effect" is beneficial to earth since it enables life to exist. The "greenhouse effect" is created by carbon dioxide reflecting heat from the earth's surface, making the planet warm and livable.

2. The "greenhouse effect", however, may be increasing due to the excessive release of greenhouse gases. Many scientists predict that global warming is occurring, which could change climates around the world.

3. During the last 200 years, enormous amounts of greenhouse gases have been released from the burning of fossil fuels, including wood, coal, gas and oil.

AIR POLLUTION
GENERAL INFORMATION:

1. Many of our agricultural methods and ways of producing energy are damaging the environment. The burning of fossil fuels, for example, increases the amount of acid rain, greenhouse gases, and smog.

2. Deforestation, partially caused by the burning of firewood in an effort to create pastures and crop lands, releases soot and harmful trace gases into the atmosphere.

3. The breeding of cattle and the cultivation of rice fields generate methane gas that decreases the ozone layer and adds to the "greenhouse effect".

AIR POLLUTION GEOGRAPHY:

1. Air pollution is not limited to any one country or area on the planet. It travels across national boundaries and encircles the globe.

2. Scientists report that the ozone layer around the entire earth has decreased, affecting virtually everyone on earth.

3. The depletion of the ozone layer is greatest in the heavily populated areas of Europe, North America and the Soviet Union.

AIR POLLUTION GEOGRAPHY:

1. The "ozone hole," an area of severe ozone depletion, has appeared each spring over the Antarctic since 1975.

2. Some scientists predict that the ozone hole will spread out to encompass larger areas of Australia, New Zealand, Brazil, Argentina, Chile and Uruguay.

3. CFC's, which decrease the ozone layer, are used most heavily by the United States, Europe, Japan, and the Soviet Union.

AIR POLLUTION
GEOGRAPHY:

1. Acid rain, sleet, snow and wind travel through the atmosphere and can cover great distances before being deposited.

2. Many of West Germany's forests are defoliated due to acid rain. West Germany claims that at least 50% of the acid rain deposited within its borders originates in other countries.

3. England, with its heavy dependence on coal, is responsible for more acid rain in Norway than Norway is itself. England is also responsible for much of Sweden's air pollution.

AIR POLLUTION
GEOGRAPHY:

1. In Bavaria and West Germany, entire forests have died due to acid rain. In Sweden, 4,000 lakes have died from acid rain.

2. In the Adirondack and Pocono Mountains of the eastern United States, mountain lakes and their fish are dying from the effects of acid rain.

3. In the eastern United States, $7 billion of damage occurs from acid rain each year.

AIR POLLUTION GEOGRAPHY:

1. In 1988, 5.5 billion tons of carbon dioxide were pumped into our atmosphere as a result of the widespread use of fossil fuel. The largest contributor of carbon dioxide pollution is the United States.

2. Two thirds of all carbon emissions are from the industrialized nations. However, carbon emissions are skyrocketing in Third World countries like Africa, Latin America, the Middle East and some Asian nations.

3. In addition to fossil fuel, billions of tons of carbon emissions are released from the burning of tropical rainforests. The tropical rainforests form a green band around the globe, approximately 10 degrees north and south of the equator.

AIR POLLUTION GEOGRAPHY:

1. An increasing "greenhouse effect", caused mainly by carbon emissions, could disturb world climates.

2. Some climate models predict increasing summer droughts over midcontinental North America and the Eurasian continent. This could diminish world food supplies.

3. Many cities around the U.S. may have increasingly more days with temperatures over 100 degrees. Cities whose temperatures could rise include Washington, D.C., Omaha, Chicago, Los Angeles, Denver and Dallas.

AIR POLLUTION
GEOGRAPHY:

1. Some climate models are predicting that sea levels may rise because of the increased "greenhouse effect." Coastal areas may face a rise in sea level.

2. Some areas that might experience possible flooding include Florida, the Netherlands, Bengal, parts of Asia and Bangladesh.

3. There may be some **benefits** from global warming. Winters in Canada and Siberia could be less severe. The changes, however, are expected so soon that even seemingly apparent benefits could be disruptive.

AIR POLLUTION
GEOGRAPHY:

1. Another potential problem of global warming would be its effect on trees and forest ecosystems. Trees in the mid and upper latitudes of the planet may not adapt to a warmer climate.

2. These trees might die and rot, releasing additional carbon dioxide, which may accelerate global warming.

3. Current widespread clearing of the rainforests is also adding to the global warming. Rainforests are being cleared in Brazil, Costa Rica, Africa, Madagascar, Malaysia, northeast Australia and other countries.

AIR POLLUTION
POLLUTION CONCERNS:

1. Air pollution is damaging to human health. It causes birth defects, lung and cardiovascular diseases as well as cancer.

2. The people most susceptible to air pollution include babies, children and people with respiratory or heart disease.

3. Pollution related cancer is on the rise and may be due to the increased use of chemicals in the last 30 to 40 years.

AIR POLLUTION
POLLUTION CONCERNS:

1. The burning of the tropical rainforests creates smog and adds to the "greenhouse effect".

2. Forests normally affect the heating and cooling of the air. They help maintain humidity, provide protection from winds and may influence rainfall.

3. Some scientists fear that the loss of the tropical rainforests, which are being destroyed at alarming rates, may alter climates on a worldwide scale. Rainfall patterns would change and temperatures might increase as well.

AIR POLLUTION
POLLUTION CONCERNS

1. Depletion of the ozone layer by CFC's could result in serious health problems. Increased ultraviolet radiation could reach the earth.

2. Increased ultraviolet radiation increases skin cancer and depresses the body's immune system, thus lowering resistance to disease and infection.

3. The depletion of the ozone layer may also cause an increased number of cataracts, a clouding of the eye lens which blurs vision. Scientists fear that all people everywhere will be adversely affected by the thinning of the ozone layer.

AIR POLLUTION
POLLUTION CONCERNS:

1. CFC's, which damage the ozone layer, are used in foams, solvents, and refrigerants. As they travel upward in the atmosphere, they release chlorine which attacks the protective ozone.

2. A single molecule of CFC can destroy 10,000 ozone molecules. This depletes the protective layer of ozone.

3. CFC's take six to eight years to travel to the ozone layer, but once there, they stay dangerously active for possibly hundreds of years.

AIR POLLUTION
POLLUTION CONCERNS:

1. The current measurements of ozone depletion are alarming, but they only indicate the damage from CFC's released up to the early 1980's.

2. More gases have been emitted and are now rising into the atmosphere, which will worsen conditions in the next few years.

3. Increased ultraviolet radiation may also negatively affect plants and crops. Growth of crops may decrease and phytoplankton, the basis of the food chain in the ocean, may be damaged.

AIR POLLUTION
POLLUTION CONCERNS

1. Acid rain has caused much environmental damage. Hundreds of lakes in Scotland, Scandinavia, Canada and the U.S. are fishless due to acid rain.

2. Forests and lakes in parts of Europe have suffered from acid rain. Some scientists predict that parts of Europe may be permanently damaged as a result of acid rain and that the costs to reverse this destruction are beyond economic reach.

3. Acid rain harms human health and well-being. It is considered to be the third cause of lung disease, after active and passive smoking, and also is a factor in diseases of the brain such as Parkinson's and Alzheimer's disease.

AIR POLLUTION
POLLUTION CONCERNS:

1. Many scientists are predicting that the increased release of greenhouse gases will cause global temperatures to change rapidly.

2. Some potential results of global warming might include severe droughts, extreme heat waves, and more devastating hurricanes.

3. The climate could change so rapidly, such as within twenty or thirty years, that countries will not be able to adjust quickly enough. Animals and plants may also not adjust in time and some may become extinct.

AIR POLLUTION
POLLUTION CONCERNS:

1. One potential threat of global warming is a rise in sea level. Increased temperatures could expand the oceans and cause possible melting of the glacier ice caps.

2. Rising sea levels could dislocate millions of people who live along coastlands around the world.

3. Rising sea levels could also erode beaches, cause flooding, drown coastlands, and decrease food production in those areas as well.

AIR POLLUTION SOLUTIONS:

1. There are many things an individual can do to reduce air pollution. To decrease carbon dioxide emissions, for example, individuals can join car pools or use public transit.

2. Riding bicycles or walking when possible, instead of driving, can help to reduce some toxic emissions.

3. Conserving energy by insulating homes, turning off lights when not needed, and using appliances only when necessary will also help reduce air pollution.

AIR POLLUTION SOLUTIONS:

1. Individuals can also reduce their use of disposable goods. Take a survey at home, noting how many disposable goods, such as disposable diapers, razors, lighters, utensils, etc., are used on a daily basis. Consider reusable alternatives and begin using these products.

2. Styrofoam goods of all sorts should not be used. Fast food chains can be encouraged to use recyclable packaging.

3. Two ways to help protect the ozone layer include using air conditioning sparingly and writing computer manufacturers to ask them to stop using solvents that contain ozone-damaging CFC's.

AIR POLLUTION SOLUTIONS:

1. Individuals can educate themselves and others by forming global climate study groups at school, in a neighborhood, at church or community centers.

2. Individuals can check to see if they use products containing CFC-11, CFC-12, CFC-113, CFC-114, CFC-115, Halon 1211, Halon 1301, Halon 2402. If so, they can refuse to use these products in the future.

3. Individuals can support groups that attempt to preserve tropical rainforests and refuse to use products from the rainforests such as rattan, teak or mahogony furniture.

AIR POLLUTION SOLUTIONS:

1. Countries have begun and must continue to take action to reduce air pollution. In 1978, the U.S. banned the use of most aerosol products. Canada, Sweden and Norway have joined the U.S. in this effort and many other countries have limited their use of aerosols as well.

2. In 1987, 35 countries signed an international treaty called the Montreal Protocol. This treaty states that CFC emissions will be reduced by 50% by the year 1998.

3. Sweden is the first country in the world to claim that it will eliminate all CFC usage by 1995.

AIR POLLUTION SOLUTIONS:

1. Individuals can support the development of alternative energy sources such as solar, wind, and hydroelectric options. Individuals can also promote energy conservation on a local or national level.

2. Individuals can also identify and support political candidates who care about the environment.

3. Companies such as ITT recently stated that they will stop using CFC's in manufacturing by 1995. Individuals can support such companies by buying their products and giving them publicity.

AIR POLLUTION SOLUTIONS:

1. Governments from around the world can invest in research to protect the environment. One example might be governmental support of research on new approaches to air conditioning and refrigeration to eliminate CFC use.

2. Aerosol cans are still the largest source of CFC emissions around the world. Concern from both individuals and governments can help reduce the use of these products.

3. A worldwide effort to redirect funds to the environment are being suggested. Some people feel that monies should be taken from military spending and used to improve the environment.

AIR POLLUTION SOLUTIONS:

1. Recycling saves energy and helps to preserve natural resources as well as helping to reduce air pollution. Locate the recycling centers in your area.

2. To recycle newspaper, tie newspapers into bundles or put them in a paper bag. White paper should go into a separate container.

3. To recycle glass, remove lids from bottles and jars and rinse out well. Some recycling centers will ask that glass be separated by color.

AIR POLLUTION SOLUTIONS:

1. Reuse is the most efficient form of recycling because it requires no new natural resources or energy.

2. Using products that are made for reuse such as cloth diapers, cloth napkins, towels, rags and sponges as well as reusable dishes and silverware all help to prevent further air pollution.

3. As a recycler, it's important to purchase products made from recycled goods. Check with companies in your area to see if they use such items. If not, suggest that they begin to do so.

5 Scavenger Hunt

Discovery: A Scavenger Hunt

A Scavenger Hunt is an exciting way to learn about any topic. Designed as a data collecting activity, it is a motivating way to encourage students to collect facts and information from a variety of sources. Many of the items collected or created will encourage students to think more deeply about their topics.

The intent of the Scavenger Hunt is to prepare students for the section on Researching Your Topic. The Scavenger Hunt also provides an abundance of information in a variety of ways—pictorials, maps, graphs, charts, models, dioramas, poems, tee-shirts, brochures, reports, and posters.

The materials gathered during this activity are valuable for the research section. They provide a good resource for quick information when students are problem-solving. Some of the items such as songs, charts, and murals may also be displayed or used in the final presentations on the last day of the Summit. If your Summit is going to be a school-wide or community event, these displays are an excellent way to inform others about the issues your class has studied.

Structuring a Scavenger Hunt

Introduce this activity by asking students if they have ever participated in a scavenger hunt. Explain that they will work together in teams to collect data or create as many of the projects on the Scavenger Hunt list as possible, within a given amount of time. If you would like this to be a competitive activity, the group that collects the most points may be declared the winner.

Divide your class into groups of approximately four students and pass out the Scavenger Hunt list. Tell the class they will have six days to gather information and create their products. On the seventh day, the points are tallied and the information is shared. It is recommended that some class time be initially provided so that groups may meet and work collectively on their projects.

After handing out the Scavenger Hunt information, give students 15 to 20 minutes to go over the list and plan a strategy. Stress the importance of developing a TEAM STRATEGY. Suggest that they decide what steps are needed to successfully complete the task. This might include assigning individual duties, establishing a timeline, and deciding their total point goal. Individual jobs might include record and tally keeper, researcher, artist, etc.

Students may also suggest additional projects, that do not appear on the Scavenger Hunt list. In this case, groups must get your permission and have you assign a point value before adding any new suggestions.

It is helpful to post each group's total point goal. As materials are brought in, they can be listed and tallied. This keeps a running total, provides a convenient way to check progress, and is a great motivator! It also shortens the final tallying process and allows for extra sharing time.

Within two or three days, your classroom may well be overflowing with data in a myriad of forms. Some teachers have used their hallways to display the information, indeed an effective way to share the wealth of facts your students have gathered.

On the seventh day, tally the data and provide class time for sharing the final projects. Point values can be assigned according to the quality of the product. If you deduct points, explain to students why and make suggestions for improvement.

Evaluation of the Activity

After the Scavenger Hunt is completed, pass out the Discovery Evaluation for each student to complete. Allow 10 to 15 minutes for groups to discuss each of the questions, then approximately 15 to 20 minutes for students to complete the evaluation individually.

The Discovery Evaluation responses will indicate the amount of knowledge gained in the hunt and will reveal any further questions the students may have. These questions can be posted and used to initiate the next activity, Researching Your Topic.

The Scavenger Hunt and Nothing But the Facts activities will motivate students to begin researching the complex problems associated with their global issue.

This activity was inspired by the "Cultural Studies Series—Teaching About Diversity: Latin America," University of Denver, Center for Teaching International Relations. The program uses a similar process for helping students learn about Latin America.

Air Pollution Discovery: A Scavenger Hunt

Air pollution is a serious worldwide problem that threatens the well-being of all life on the planet. Our skies are used as giant waste receptacles. Humankind pours millions of tons of pollutants in the skies each year from car exhaust, heating, industry, burning wastes and chemical sprays. Air pollution damages the health of plants, animals and people. Scientists fear that it may alter the climate on earth, cause sea levels to rise, interrupt natural food chains and lead to widespread skin cancer.

There are many things people can do to decrease the fouling of the skies. One of the most important things to do is to become informed. Learning about air pollution and sharing what you know with others is an effective step towards reducing this environmental threat. The following Scavenger Hunt will help you learn about many aspects of this complicated problem.

Rules for Scavenger Hunt

1. You must work in groups with each member contributing equally to the whole group effort.

2. You can go anywhere that is appropriate to obtain your data. Cameras and tape recorders may be used to record information. Written summaries of television shows, hand-drawn maps and diagrams are acceptable.

3. Use primary sources when possible.

4. The sources of all data must be recorded.

Items to Collect and Create

1. Make a map of the world showing where air pollution is most severe. (10 points)

2. Collect five pictures of areas damaged by air pollution. (5 points) BONUS: Add 10 points if you label your pictures and include two facts about each picture.

3. Collect two articles from magazines that explain efforts to reduce air pollution. (5 points) BONUS: Add 10 points if you include a written summary of the articles.

4. Create a chart that ranks in order the main causes of air pollution. (5 points)

5. Draw a before-and-after picture of a lake or forest damaged by acid rain. Include labels and information about where the lake or forest is located and what has happened to it. (15 points)

6. Watch a television show that talks about the problem of polluting our skies. Create a chart or poster that shares what you learned from the television show. (10 points)
BONUS: 10 points for each additional show viewed.

7. Make a chart that lists the organizations which concentrate on dealing with the problem of air pollution. Include the name of the organization, address and phone number. (10 points)

8. Choose one of the ozone depletion problems from the list below. Write a poem or song that includes at least five facts about the problem. Mention in the song the necessity for finding ways to solve the ozone problem. (20 points)

   - weaken the human immune system
   - skin cancer
   - disruption of food chains
   - cataracts

9. Create a timeline that shows the increase in air pollution from the year 1900 to the present. (15 points)

10. Design and make a poster that informs others about air pollution. (15 points)

11. Make a list of at least five different kinds of toxic chemicals that are released into the air each year. Explain what the chemicals are used for. (10 points)

12. Make a model of a smokestack that does NOT allow pollutants to escape. (15 points)

13. Research why the MacDonald's Restaurant chain plans to stop their use of styrofoam containers. Write a paragraph explaining why. (10 points)

14. Make a mobile with pictures or drawings of the main sources of air pollution. (10 points)

15. Draw a map that traces the route of acid rain from its source to where it finally is deposited. (10 points)

16. Write an article for your school or community newspaper that explains the problem of air pollution and give five suggestions for what individuals could do to help combat the problem. Submit the article for publication. (25 points)

17. Design a t-shirt or button that would make others aware of air pollution. (15 points)

18. Draw a model of a catalytic converter and write an explanation of how it reduces car exhaust. (15 points)

19. Research what your state is doing to reduce air pollution. Make a list or mindmap explaining its efforts. (10 points)

20. Imagine a model community that is able to effectively eliminate air pollution. Write a story about how the community is able to achieve this. (25 points) BONUS: 10 additional points if your story has two or more illustrations or charts.

21. Make a chart that explains the theory of the "greenhouse effect" and its increase as a result of excessive emissions of harmful trace gases. Also show on the chart what might happen to our global climate if the "greenhouse effect" continues to increase. (15 points)

22. Collect three pictures of the effects of air pollution on buildings, statues or other non-living objects. Label them and explain the damage that has been done. (10 points)

23. Make an Air Pollution Alphabet Book that tells about this problem. (25 points)

24. Research what is being done to revive forests, lakes or streams damaged by air pollution. Write an explanation of the reclamation effort. (15 points)

25. Prepare and perform a skit for your class that includes at least ten facts about air pollution. (15 points)

26. Interview someone from the closest office of the Environmental Protection Agency about what a citizen can do to reduce air pollution. The interview can be conducted over the phone or in person. Before you do the interview, make sure that you have a list of questions to ask. Make a chart of the suggestions to be displayed at school. (20 points)

27. Locate on a map, at least five major cities from around the world that suffer from smog. Also write a description of the health problems suffered by the residents of these cities. (10 points)

28. Research and then draw a diagram demonstrating the chemical reaction of CFC's in the ozone layer. Show how CFC's destroy ozone molecules. (10 points)

29. On a world map identify where tropical rainforests were once located, where they have been destroyed, and where they remain. Write a paragraph explaining how the burning of the tropical rainforests contributes to air pollution. (15 points)

30. Create your own projects on air pollution for the scavenger hunt. Get your teacher's approval and together determine the number of points possible.

Evaluation Sheet for Discovery

NAME:______________________________DATE:________

TEAM MEMBERS:____________________________________

1. What information did you discover that indicates how critical this problem is?

2. What was the most interesting thing you discovered? Why?

3. Can you find two pieces of data that pose contradictory information about this problem? List the sources and the differences discovered and why you think they are in conflict.

4. Which item or activity gave you the most useful information? Why?

5. As a result of this Scavenger Hunt, what new action will you take to better understand and help solve this critical problem?

6. Describe the strategy used by your group to complete the Scavenger Hunt. How did it work? What would you do differently next time?

7. Did you experience any conflict in your group? Describe the conflict and how you did or did not resolve it.

8. What did you like best about this activity?

9. What would you change about this activity?

10. During the past week while working on the Troubled Skies project I would like to thank ________________ for . . .

11. In order to relax right now, I would like to . . .

12. If I were evaluating my Troubled Skies project work, I would say I have earned __________________ because . . .

13. If I were evaluating my group's Troubled Skies project work, I would say we have earned _________________ because . . .

6 Map Activity

Where in the World? A Brief Geography Lesson

This activity will provide students with the opportunity to develop map-reading skills. Each student will need a small map of the world that includes longitude and latitude lines. You should have a large world map to demonstrate your explanations.

First, explain the concepts of longitude and latitude to the students. You might want to share the fact that these imaginary lines enable us to locate any point on earth. Latitude lines run around the world parallel to the equator. The equator has a latitude of 0 degrees. The North Pole has a latitude of 90 degrees north, sometimes shown as +90 degrees. The South Pole has a latitude of 90 degrees south, which is sometimes written -90 degrees. Ask students to locate the equator and the North and South Poles.

Longitude lines run north and south. Most nations count longitude east and west beginning with an imaginary line at Greenwich, England. Greenwich lies at 0 degrees longitude. A place halfway around the world from Greenwich is at 180 degrees longitude. The earth is divided into two hemispheres, each with 180 degrees. Longitude locations west of Greenwich are referred to as west longitude and those east of Greenwich have east longitude locations. Ask students to locate Greenwich and areas east and west of Greenwich as well.

Once students understand the concepts of longitude and latitude, ask them to look at their maps and find the longitude and latitude of major cities such as Los Angeles, New York, Miami, or Seattle. Have them look for a country and give the coordinates which the nation encompasses. When students are able to identify the correct meridians, they are ready to move on to the next activity.

Ask students to individually consider one place in the world where their global problem is especially severe. They could consider cities, countries, oceans, continents, etc. Instruct students that they are not to share with others where their trouble spot is located. When they have decided upon their global problem area, they then need to determine the latitude and longitude of this location. It is now time for geography riddles! Students will, one at a time, tell the class the longitude and latitude degrees of their particular spot. Class members are to locate these meridians on their maps and tell the name of the place. The student who has given the meridian points must validate the responses, and also must share the specific nature of the global problem at that location. You may also ask students to draw or note on their maps information they have learned to date. Additional data can be added as it accumulates.

Where in the World? A Brief Geography Lesson

This activity will acquaint you with map-reading skills. You will need a small map of the world that includes longitude and latitude meridians.

To read maps, you'll need to understand the concepts of longitude and latitude. These are helpful imaginary lines that enable us to locate any point on earth. Latitude lines run around the world parallel to the equator. The equator has a latitude of 0 degrees. The North Pole has a latitude of 90 degrees north, sometimes shown as +90 degrees. The South Pole has a latitude of 90 degrees south, which is sometimes written -90 degrees. Locate the equator and the North and South Poles on your map.

Longitude lines run north and south. Most nations count longitude east and longitude west, beginning with an imaginary line at Greenwich, England. Greenwich lies at 0 degrees longitude. A place halfway around the world from Greenwich is at 180 degrees longitude. The earth is divided into two hemispheres, each consisting of 180 degrees. Longitude locations west of Greenwich are referred to as west longitude and those east of Greenwich as east longitude. Locate Greenwich on your map. Identify some west and east longitude locations on your map.

To further practice the concepts of longitude and latitude, look at your map and find the longitude and latitude of major cities such as Los Angeles, New York, Miami, or Seattle. Look for a country and give the expanse of latitude and longitude meridans which the nation encompasses.

Next, consider one place in the world where a global problem is especially severe. You may want to consider cities, countries, oceans, continents, etc. Do not share with others where your trouble spot is located. When you have decided upon your global problem area, next determine the latitude and longitude of that location. It is now time for geography riddles! When it is your turn, tell the rest of the class the longitude and latitude degrees of your spot. Your class members are to locate the meridians on their maps and tell the name of the place you have chosen. You will need to validate their responses and also share the nature of the global problem at your location. Enjoy guessing your classmates' riddles as well.

7 Research and Independent Study

Self-Directed Learning: Researching a Global Issue

In the following activity, students have the opportunity to direct their own learning. Students will pursue a topic of personal interest, develop their own approach to research, and create their own project design. The intention of the self-directed activity is to let students assume responsibility for their learning. They will enjoy pursuing a topic of special interest to them while mastering independent learning skills, useful both within the classroom and without.

Students will progress through a five-step process. First, provide students with copies of Steps to Self-Directed Learning and the Independent Project Contract located on the following pages. Introduce each of the steps by having a brief class discussion to clarify and explain what is expected of them and also to address any questions they might have. You may want to brainstorm possibilities for study with the entire class. Students can refer to the list as a starting point when choosing their topics. You may also want students to keep their self-directed learning papers in some sort of file folder. The entire process can span from one to three weeks.

After completion of their independent research and in-class presentations, you may want to suggest that students share their knowledge with other classes, other schools, or create community forums. Or, you and your students may decide to wait for Step 2 of the Summit process to share their research in small groups.

To bring closure to this unit, you might ask your class what they have learned about being a creative and independent learner and how the skills used in this lesson can be applied to "everyday life."

Steps to Self-Directed Learning

Researching a Global Issue:

From your previous activities with the Fact Cards and the Scavenger Hunt, you have acquired a lot of information about your global topic. You will now have the opportunity to select one aspect of this topic that holds special concern for you. What have you encountered so far that was particularly interesting? Is there something more you would like to find out about?

STEP 1

So that you can independently direct your own learning, you will first need to decide upon your topic. Select one aspect of the global problem that intrigues you. You may instantly know what you would like to study or you may want to refer back to the Fact Cards or the Scavenger Hunt for ideas. Once you have determined your area of interest, narrow your topic down so that it is manageable to research. Get your teacher's approval before you begin Step 2.

STEP 2

To complete Step 2, you will need to make decisions about two important aspects of your project. First, determine at least three things that you want to learn. To do this, write your topic down on a piece of paper, then list a minimum of three items you are curious about. Perhaps you will want to answer the questions: **who, what, when, where** and **why** as they relate to the subject. Perhaps you have questions that spring to mind immediately. Once you begin researching, you may change your mind about some of the original questions you listed, or something else may appear intriguing. Do go ahead and pursue your new interests if this should occur. However, it's important to begin your research with a focus.

After you have written what you want to know about your topic, write a paragraph explaining what your final achievement will be. Perhaps you will create a model or a demonstration that will explain your subject. Be creative and develop an end product that will be fun and interesting for you to do, for example, make a model, write a song, do a collage, or make up a story or skit that includes factual information.

STEP 3

Once you have determined your topic and what you want to learn about it, you need to gather information. Data can come from books, but it can also be found in a variety of other sources. Your research will be enjoyable if you use many different approaches to gathering information. Identify three ways to gather data. You may want to choose from among the following, or create your own suggestions:

- Call a nearby university or other organization to determine if someone there is knowledgeable about your topic. If so, conduct a telephone interview. To do this, you will need to make a list of questions ahead of time so that you are fully prepared before speaking with the expert.
- Use your school or city library. Do not rely strictly on encyclopedias or books. Ask your librarian to help you locate governmental documents, films, videotapes, magazines, and newspapers that may contain information you need.
- Watch for pertinent television or radio shows. Check the educational television station in your area to find out what their programming includes.
- Your teacher can order films and videotapes on your topic from the educational service district nearest your school. You may want to request that either you or your instructor look through the film catalogue to determine what might be of value to your research.
- Conduct a survey at school or in your neighborhood where you ask people pertinent questions. Record their answers on a survey form that you create.

What are other suggestions you might have for finding the information you will need? Write on a piece of paper the three approaches you will use in your data collection.

STEP 4

Now that you have determined your topic and how you'll conduct your research, you are ready to complete an Independent Project Contract. This will provide both you and your teacher with an overview of your entire self-directed learning experience. Please complete the following form and have your teacher initial it. Enjoy learning independently!

Independent Project Contract

Student Name____________________________________

Date____

Project ____

Title____

Planned Completion Date____________________________

Three items you will learn about your topic:

1.

2.

3.

Three information sources you will use:

1.

2.

3.

Final Product:

Project Timeline: List what you will accomplish and when:

Presentation: Describe what you will share with the rest of the class and when you will do the sharing:

Teacher initial: ________

STEP 5

After you have completed your in-class presentation, you can then evaluate the quality of your work. Your instructor will provide you with feedback as well. The following form can be used by both you and your teacher to determine what is done well and what is in need of improvement.

Evaluation of Self-Directed Learning Experience

Student name: ______________________________

Process Evaluation

1. Used time effectively in class:

1 2 3 4 5

Least time effective — Most time effective

Comments:

2. Used time effectively outside of class:

1 2 3 4 5

Least time effective — Most time effective

Comments:

Project Evaluation

1. Used a variety of different information sources:

1	**2**	**3**	**4**	**5**
One information source				Five or more information sources

Comments:

2. Completed project according to the project timeline:

1	**2**	**3**	**4**	**5**
Project not on target				Completed

Comments:

3. Showed effort:

1	**2**	**3**	**4**	**5**
No effort				Excellent effort

Comments:

4. Creativity:

A. Fluency (number of ideas)	1	2	3	4	5
B. Flexibility (different ways of sharing ideas)	1	2	3	4	5
C. Originality (uniqueness)	1	2	3	4	5
D. Elaboration (development of ideas)	1	2	3	4	5

Comments:

5. Other Comments:

8 Youth Summit

Overview of a Youth Summit

Once students have completed their research, they are ready to begin the Summit process. The Summit uses a problem-solving approach that encourages the use of creative and critical thinking skills. The particular model outlined for the Summit process is a synthesis of the work of E. Paul Torrance, Alex Osborne, and Bob Stanish. Some aspects have been adapted to fit the needs of the Summit.

The Summit is designed to encourage students to take action. It also serves to alleviate any frustration, anxiety, and/or fear that may have built up as a result of the in-depth research done in the previous activities.

By going through the Summit process, students will develop the skills inherent to effective problem solving. The process stretches students to engage in higher cognitive functioning, to learn to work effectively in groups, and to improve their communication and writing skills. Most important, it moves students from the level of theory to the level of practical application.

Structuring a Youth Summit:

Time

The entire process, including the final presentations, will take approximately 8 to 12 hours. This can be structured as a Summit or it can be extended over a week-long period. We recommend a two- to three-day Summit to focus student interests and to provide uninterrupted time for concentrated exploration. However, this is not always possible. Conducting the Summit over a one-week period can work well, especially if you provide time to review the previous day's work and facilitate closure at the end of each working period.

Materials

We recommend that each student be provided with a copy of the Summit Journal. This outlines the problem-solving process and provides a place for your class to record their efforts. This becomes a valuable evaluation tool and should be checked at various intervals throughout the Summit. Additional materials include butcher paper and colored marking pens. Art supplies and reference materials should also be available.

Establishing Problem-Solving Groups

We recommend groups of four to five students. If cooperative learning is new to your students, you might consider setting up groups of three. The grouping works best if it is heterogeneous in terms of ability and talents. You may want to have students work in the same groups as were arranged for the Scavenger Hunt activity.

Work/Display Area

If you are holding the Summit in your classroom, establish work/display areas for each group. Tables work best; however, desks can be put in a circle or square. If possible, provide wall and counter space so that students may display the information gathered during the Scavenger Hunt and Self-Directed Learning. Students will also be displaying information generated during the problem-solving process. You may want to establish one main resource area where books, pamphlets, posters, and articles may be stored for easy access throughout the Summit.

Problem-Solving Process

You will want to familiarize students with the problem-solving process before the Summit. See the next section, Facilitator's Guide, for more detailed information. For easy reference, we have included an agenda with approximate times.

Introduce each step to the entire class, and then have the students begin the process. Establish a time limit, then add more time if needed. Some groups may work through the process faster than others. You can give them instructions for going on to the next step.

As students work through the process, move from one group to the next to observe interaction. Clarify the process when necessary, help resolve group conflicts if they arise, and provide needed information or directions for finding it.

Preparing Presentations

At the onset of the Summit, explain to students that each group will be responsible for planning a 10- to 15-minute presentation for the class. This presentation will focus on informing others of the problem they have worked on and their proposed solutions. Students should start thinking about this at the onset. They are encouraged to be creative in the manner with which they present their material. Encourage them to use charts, graphs, illustrations, pictures, skits, poems, songs, dances, or stories to teach the others. They might also consider ways to get their classmates involved in helping them carry out their solutions.

At the conclusion of each presentation, allow time for questions or suggestions from the audience. This period can take up to three hours depending upon the number of groups sharing and the length of the presentations. Group presentations often range from five to twenty minutes.

You may also decide that your students should share their work with other classrooms, schools, parents, and/or community members. To manage this step, ask students to submit an outline of their project for your approval. Also, students will need time to rehearse. Much of the materials produced during the Scavenger Hunt can serve as visual displays; however, some groups may need additional time to develop props, costumes, charts, and hand-outs.

Taking Action

This is the most exciting part of the process. Here students take action and begin effecting change. It may be necessary to set aside time each week for students to work on their action plans. There are a myriad of possibilities for taking action and you may find your class involved in creating a game, making a film, writing a book, starting a newsletter, raising money for a project, conducting research, getting signatures for a petition, surveying the community, or making public service announcements for a local television station, to name a few of the possible outcomes.

NOTE: The processes and times shown on the following page are merely suggestions. You are encouraged to make adaptations to fit your needs and classroom situations.

Our Only Earth

Youth Summit Agenda

(Suggested Times)

STEP 1 — Introduction/Problem Exploration (30 minutes)

STEP 2 — Sharing Research (1 - 1.5 hours)

STEP 3 — Brainstorming Problems (30 minutes to one hour)

STEP 4 — Brainstorming Solutions (30 minutes to one hour)

STEP 5 — Evaluating Solutions (1 - 1.5 hours)

STEP 6 — Carrying Out Solutions (1 - 1.5 hours)

STEP 7 — Presenting Solutions (1 - 3 hours)

Facilitator's Guide: Youth Summit Process

STEP 1—Introduction/ Problem Exploration

GOAL: To share feelings, thoughts, and ideas surrounding the global issue.

OBJECTIVES: To communicate feelings, thoughts, and ideas concerning the issues surrounding the problem.

TIME: Approximately 30 minutes.

PROCESS: Begin by introducing the problem-solving process to be used throughout the Summit. It is helpful to go over each of the seven steps. Students can follow along in their Summit Journal, which serves as a guide as well as a place to record their progress. These journals are also helpful in evaluating students' work.

(OPTIONAL): Depending upon the age and experience of your class, you may want to practice the problem-solving process with a problem that students are currently trying to resolve, i.e., improving grades or saving money. This trial run will familiarize students with the key components of effective problem-solving and usually takes about one hour of class time.

No matter how you introduce the problem-solving process, emphasize the need for students to work together in a cooperative and collaborative manner. For information on implementing cooperative learning in the classroom, refer to the work of Roger T. Johnson and David W. Johnson. Their books are helpful in structuring cooperative learning in the classroom: *Learning Together and Alone, Circles of Learning*.

Once students are familiar with the Summit process, initiate Step 1 by having them record their individual reflections on their particular global issue. Ask them to write in their Journals any feelings, thoughts, ideas, images, and/or fears about this issue.

After students have an opportunity to reflect, allow time for sharing with members in their groups. You may also want to provide time for a classroom discussion. If so, have each group choose someone to summarize their discussion for the benefit of the whole group. Remind students that each time information is shared with the whole group, a new spokesperson will be selected. Encourage students to record any new bits of information, key ideas, or insights that emerge during the sharing.

STEP 2—Sharing Research

GOAL: To learn from others about the issue.

OBJECTIVES:

- Share research information.
- Categorize key ideas generated by the group.
- List any unanswered questions.
- Develop strategies for discovering answers to any unanswered questions.

TIME: 1 - 1.5 hours.

PROCESS: In this step, students share their independent research, completed in the previous activity (self-directed learning), with members of their problem-solving groups. After the presentations and sharing of research, have students categorize key ideas and information on a Data Retrieval Chart. An example is given below. Have students make their own chart on a large piece of butcher paper. This information can be posted in the group's work area.

Sample Data Retrieval Chart

Name	Who	What	When	Where	Why

To complete the Data Retrieval Chart, each student summarizes and inserts the information in the appropriate categories. They begin by each placing their name in the correct column and then completing one horizontal section of the chart. Each student, then, should contribute a who, what, when, where, and why fact to the chart. The completed chart organizes and categorizes facts and information for easy reference during the Summit process.

Once students have shared their Independent Research Projects and have filled out the Data Retrieval Chart, you may want to allow time for each of the problem-solving groups to share their data and information with the entire class. Have problem-solving groups designate a NEW spokesperson.

As each group reports information, ask the other groups to indicate if they have listed similiar information. If so, they should mark this information so that it is not repeated again, but simply acknowledged. Groups are encouraged to add to their Data Retrieval Charts as new information emerges.

An additional use for the Data Retrieval Chart is to have students consider their global issue from diverse viewpoints. Students can first suggest a variety of individuals or organizations involved in their issue. For example, one issue might be the use of air conditioners that generate harmful CFC's which damage the ozone layer. Some of the people involved in this issue might be homeowners from Phoenix who use air conditioning to cope with the stifling summer heat, business people who sell air conditioning products, scientists who have studied the ozone depletion problem, Greenpeace volunteers, people who have skin cancer that they believe is caused by the increased amounts of ultraviolet light penetrating the reduced ozone layer, and high school students concerned about a deteriorating natural environment. Each student could think of one group to list under the "name" section of the grid. Students can then add each group's perspective as they complete the who, what, when, where, why portions of the chart. Discussion can follow the sharing of the new perspectives involved. Point out to the students that there are always two or more sides to each issue.

STEP 3—Brainstorming Problems

GOAL: To brainstorm problems related to the issue.

OBJECTIVE:

- Identify specific problems by brainstorming sub-problems and contingent problems related to the situation.
- View the problems from a variety of perspectives.
- Choose a problem to solve.
- Define the problem.

TIME: Approximately 30 minutes to one hour.

PROCESS: Identifying the problems related to this global issue is one of the most important steps of the creative problem-solving process. Defining the problem properly will determine the quality and appropriateness of the students' solutions.

Introduce this step by emphasizing the importance of problem identification. Remind students that in identifying problems associated with this issue, it is important to view the problem from all angles. It is helpful to think about how people, nations, plants and animals are affected by this issue. Ask students to consider issues from different points of view.

Next, ask small groups to think about all of the problems related to the issue. Familiarize students with the rules of brainstorming, stressing the importance of withholding judgement, "piggybacking" on others' ideas, and freewheeling. Allow the groups approximately 15 to 20 minutes to brainstorm.

Afterwards, suggest that groups review the list of problems they generated. At this point, some problems may be combined or elaborated, as well as new ones listed.

Allow time for small groups to decide which of the listed problems they are most interested in solving. Once each group has chosen a problem, they are ready to move on to problem definition.

To define the problem, students need to think of different ways to state the problem. It is sometimes easier to generate solutions when the problem is posed as a question rather than a statement. Ask students to think carefully about the verb they use in their definition. A strong verb will focus their energies. An example might be: How can we *decrease* the use of cars by our families? Or: In what ways can we *inform* our community about the dangers of CFC's? Have students experiment with the use of different verbs when selecting their questions and ask them to answer the questions in this section of their Summit Journal. They will undoubtedly note that as they change their definition, the focus for solutions will also change.

As each group defines their problem, move about from group to group, checking for strong verb usage and making sure they are on the right track.

Once students have completed the task, allow time for reviewing information and facts, keeping in mind the specific problem they have chosen. New questions may arise, and students may find they need more information before they can generate solutions. If so, groups should plan a strategy for gathering new information. Depending on how many groups need to do more research, you may want to allow additional classroom time or have students complete the research as homework.

STEP 4—Brainstorming Solutions

GOAL: To brainstorm creative solutions to the problem.

OBJECTIVES:

- Apply the brainstorming process for generating solutions.
- Generate many ideas, simple or complex.

TIME: Approximately 30 minutes to one hour.

PROCESS: Provide problem-solving groups with approximately 20 minutes to discuss possible solutions. Remind students that the goal of brainstorming is to generate as many ideas as possible. Emphasize the importance of withholding judgment while deliberating. For now, they can let their creativity soar; wild and crazy ideas are acceptable. One of those ideas, after a little revision, just might be the solution they are looking for. Remind students not to overlook simple ideas; solutions can range from simple to complex, and sometimes the simplest solutions are the best! Encourage students to combine solutions or add onto the ideas of others.

As students come up with ideas, have them say their plans aloud while at the same time writing them down on scrap paper. Place all pieces of paper in the center of the group, to use in Step 5. Students may also want to record their ideas in their Summit Journals. Allow additional time if groups are still brainstorming after 20 minutes.

STEP 5—Evaluating Solutions

GOAL: To decide which solutions might be the best for solving the stated problem.

OBJECTIVE:

- Decide on the top two ideas.
- Evaluate possible positive and negative outcomes.
- Evaluate possible long- and short-term consequences.
- Evaluate solutions and make a final determination regarding the "best" solution.

TIME: 1 - 1.5 hours.

PROCESS: Provide small groups with about 10 minutes to decide on the top two solutions. These solutions should be listed in order on the Evaluation Grid located in their Summit Journal and shown below.

Youth Summit Solution Evaluation Process

SOLUTIONS: Rank in order your top 2 solutions and list	**POSITIVE OUTCOMES +** List 3 positive outcomes for each solution	**NEGATIVE OUTCOMES -** List 3 negative outcomes for each solution	**POSSIBLE SHORT- & LONG-TERM CONSEQUENCES:** List the consequences that might result from the implementation of your solutions in a 1-, 5-, 10-, and 20-year time frame. Put a + or - by each consequence to signify whether it is positive or negative.			
SOLUTION #1:			**1 YEAR**	**5 YEARS**	**10 YEARS**	**20 YEARS**
SOLUTION #2:						

GROUP TOPIC:

GROUP MEMBERS:

SPECIFIC GROUP CHALLENGE:

Once the top solutions have been selected, students begin the evaluation process. For each solution listed, students will go through the following three steps:

- POSITIVE OUTCOMES — Students list four or five of the possible positive outcomes. Positive outcomes should be considered from various points of view.
- NEGATIVE OUTCOMES — Students list four or five of the possible negative outcomes. This can be looked at from the different points of view examined in step one if applicable.
- POSSIBLE SHORT & LONG TERM CONSEQUENCES— In this step, students forecast the possible consequences that might result from the implementation of their solutions over a 1-, 5-, 10-, and 20-year time frame. For each consequence, students should put a + or - to signify a positive or negative consequence.

Once students have completed the evaluation process, have problem-solving groups decide which is the best solution in light of the positive and negative outcomes, including the possible short- and long-term consequences.

Suggest that small groups discuss their final solution. Encourage them to ask if the solution clearly reflects the thinking of the entire group. Changes might also now become apparent. Students may need to modify their solutions based upon the possible outcomes and consequences. Have students answer the questions on Modifying Your Solution in their Summit Journals.

STEP 6—Carrying Out Solutions

GOAL: To develop an action plan for carrying out the solution.

OBJECTIVES:

- Brainstorm different ways to carry out the solution.
- Create a step-by-step plan for carrying out the solution.
- Brainstorm ways to inform others about this problem and suggested solutions.

TIME: 1 - 1.5 hours.

PROCESS: Thomas Edison once said that creative work is ". . . one percent inspiration and ninety-nine percent perspiration." Remind students that this is the most important part of their work. Here, their creativity will be taxed as they discover ways to carry out their solutions. While this step demands much work, it is also the most gratifying part of the process since students become empowered to take action.

Remind students that a good part of their efforts will include informing people about the problem and their proposed solutions. This can be done through a variety of ways including songs, artwork, poems, stories, plays, newspaper articles, petitions, letter writing, and editorials.

This is also the time when students generate various ways to apply their theories. These might include a letter-writing campaign, adopting a concern, or developing an organization that informs other youth about this problem and what they can do.

Fund raising is another possible project. The funds can even be used to support students' projects and concerns. It's an excellent way to inform others as well as a practical way for students to see their work in action. You might want to spend time brainstorming possible fund raising options as a whole group. Suggestions include: raffles, selling students' art work, information booths at local and community events, car washes, and/or bake sales.

At past Summits, students have generated a wide variety of projects. These include: making a game about the effects of plastics on the environment, writing a book about the issues surrounding tropical deforestation with solutions from students around the world, creating a worldwide network of youth interested in working together to save the tropical rainforests, writing letters to congressmen, setting up a booth at a local carnival to inform individuals about the ocean crisis, creating a public service announcement, and making short films to inform people about wildlife's struggle to survive.

Once small groups have their ideas, allow 20 to 30 minutes for developing their Group/Individual Action Plans. These are included in the Summit Journals and should be completed by each student. These action plans require students to list each of the steps they need to take in order to carry out their solutions, as well as to identify the person responsible for each part of the action plan. Students will also create a timeline to indicate when they anticipate the completion of each step. Finally, students are able to reflect on what the end results of their efforts might be. This is cause for celebration!

Examples of the forms that the students will complete for Step 6 follow on the next two pages:

Action Planning

You will now need to organize how to carry out your group's solution. Each of you will have individual tasks to complete. On the form below, write down your group action plan.

Youth Summit Group Action Plan Form

Group Topic: ____________________

Group Members: (Please list first and last names.)

Describe the specific problem your group decided to solve:

List your best solution:

List the specific steps your group will take to carry out the solution, beginning with what you will do **first, second, third,** and so on. Also list the name of the group member who will be responsible for doing each step:

Create a timeline stating dates of completion for the steps listed above:

Describe the end result of your efforts. What exactly will you have accomplished?

Individual Commitment

On the following form, state the responsibilities you took on as part of your personal contribution toward solving a global problem.

Youth Summit Statement of Individual Commitment to Work on an Area of Global Concern

Name: ______________________________

Area of Global Concern:

List the commitments you made to your group at the Summit:

Please describe below any additional commitments you would like to make and pursue independently:

Signature: ______________________________ Date: ________

Thank you for your efforts to make the world a better place!

STEP 7—Presenting Solutions

GOAL: To develop presentations that inform others about the issue and the plan of action.

OBJECTIVES:

- Suggest various ways to present information and solutions.
- Teach at least 10 facts to the audience.
- Actively engage the audience in learning about the issue and in taking action.

TIME: 1 - 3 hours.

PROCESS: Allow time for students to present information about the problem and their solutions to the class. Students might use some of the products from the Scavenger Hunt or Independent Research to teach others about the problem. Encourage the use of charts, diagrams and illustrations. Poetry, songs, raps, or skits can also be a great way to inform others. Emphasize the need to develop dynamic and interesting presentations that encourage audience participation.

To help the students prepare a presentation, the following three steps are included in their Summit Journals:

Step 1: Determine how you will inform the audience about your group's specific problem. What will you say or do to begin your presentation and how will you explain the issue you have addressed?

Step 2: Outline below how you plan to describe your solution and action plan to the audience. Select at least two of the strategies listed below to include in your presentation.

Presentation Stategies:

- charts, graphs, tables
- posters
- illustrations, photographs
- cartoons
- poems, songs, raps
- skits, plays, simulations
- data sheets
- booklets, pamphlets, handouts
- overhead transparencies
- slides, video, music
- audience participation

Outline of your solution and action plan:

Step 3: If appropriate, how can your group engage the support of the audience in implementing your solution? List ways that your group could involve community members, business and industry, local schools, parents, and organizations that might give support. Prepare to share this as part of your presentation.

After the students have prepared their presentations, they may want to go "on the road" with them. Exhibits can be set up in the school or public library so other students can see them. Talk to your principal about holding a school-wide assembly. There may be other students who want to get involved in the activities. A Parent Night or Community Night could be set up to inform others, not only about the issues, but also about what students have been doing to resolve them.

In Conclusion:

The actual implementation of solutions may be a year long, or longer, process for some of your students. You may find that your class will be involved throughout the school year. You may wonder how you could possibly take any more classroom time for this issue. However, many of the activities can be integrated with other areas. For example, writing will undoubtedly be an activity that all groups will participate in. Public speaking can also be incorporated into the solution-finding process. Students may get involved with state lawmakers and learn about the legislative process or they may conduct scientific research through local zoos, water protection agencies, or universities. Posters and art work might be developed as a visual means of communicating information. Likewise, students may want to write a song, perform a play or choreograph a dance relating to their topic. They may also wish to survey pertinent people or obtain feedback on their proposed solutions.

The possibilities for integrating this material into all content areas are limitless. But more importantly, we have found that through this "real life" content and the process of problem-solving and actually implementing solutions, students become highly motivated toward learning in general. In addition, students are more creative and willing to take risks. Even the unmotivated learner begins to shine as he/she is able to independently take responsibility for learning. Parents report that their children have begun reading newspapers and watching educational television. Students become more involved in school, in the community, and in the world. And most importantly, they recognize their place as caretakers of one another and of the planet.

It is imperative that the next generation have the skill and ability to effectively deal with the global challenges that will face them. The purpose of this series is to instill in students an awareness of the importance of taking action that will have a long-term, beneficial effect on the entire planet. As problems become more and more common, it is hoped that the next generation will have the sensitivity, the skills, and the desire to solve them. Our future, and our children's future, truly depend on what happens today.

Our Only Earth

SUMMIT JOURNAL

Our Troubled Skies

✍

Introduction

A creative problem-solving process will be used to structure your efforts towards finding and then implementing solutions to your global challenge. This process provides a way to capture your dreams and hopes by putting them in a practical form that enables you to make positive contributions to your community and the world community, today and in the future.

STEP 1—Problem Exploration

Reflect for a moment on the many things you have learned about your global issue. Also reflect on how that information made you feel. Did you feel frightened or overwhelmed from the scope of the problem? Do you have concern for the well-being of others? In the space provided below, write down your feelings and thoughts about this issue. Include images, ideas, fears, or anything else associated with the problem.

In small groups, discuss your feelings and thoughts surrounding this issue. Note how your feelings are similar to, or different from, other members' in the group. Be prepared to summarize your group discussion for the benefit of the whole class. Choose a spokesperson.

Record the key ideas of your group on the back of this page or on a new sheet of paper. During the discussion, add any new bits of information to your list.

STEP 2—Sharing Research

Each group member will be asked to describe to the others his/her independent research project. Use the Data Retrieval Chart (see sample below) to categorize the information you have learned as a result of the presentations. Each member's name should be listed in the Name column, and then for each person the **who, what, when, where** and **why** facts from their work. Also keep records of any new questions that come up. Discuss ways to find the answers and assign responsibilities. Choose a new spokesperson to present your Data Retrieval Chart to the entire class.

DATA RETRIEVAL CHART

Name	Who	What	When	Where	Why

STEP 3—Brainstorming Problems

Step 3 has two aspects: the first is to identify the many problems associated with your issue and the second is to define the specific problem which your group decides to address. By identifying the problems surrounding the issue, the proper definition can be determined, which influences the quality and appropriateness of your solutions.

In your group, brainstorm the problems related to your global issue. List your ideas below.

Now go back and review your list. What problems go together? Cross out any problems that are repeated. Add new ones that may come up as you review the list. As a group, decide which problem to solve.

BRAINSTORMING PROBLEMS (con't)

Problem Definition

One of the ways to clarify a problem is to phrase it as a question. Restating your problem as a question will make it clear and definite. This will also direct you to possible solutions. For example, if your issue is the disposal of waste products in your city, several questions could be formulated, such as:

- How can we educate our community about its waste disposal problem?
- In what ways could we reduce the amount of waste our community generates?
- How can we limit the amount of disposable products used in our community?
- What kind of recycling program could we create locally?

There could be many other questions as well. As you can see by restating your problem as a question, the focus becomes more clear and you may be better prepared to seek answers. These answers will later suggest solutions which will lead you to a specific group project. For now, however, the task is to take your issue and turn it into a question. On the space provided below, write your group's issue:

____

Working individually, take a couple of minutes to come up with two or three possible questions. You will want to include a strong action-oriented word in each of your questions such as any of the following:

educate
limit
decrease
reduce
inform
involve
enhance
promote
publicize

Write two or three questions that restate your issue on the following lines. Choose one of the action words above, or better yet, generate some of your own for each question you create. Circle the strong action word in each question:

1. ______________________________
____

2. ______________________________
____

3. ______________________________
____

Next, share the questions with your group. Choose one which is most fitting and write it below:

Problem Question: ______________________________
____

Before beginning STEP 4 — Brainstorming Solutions, review the information you have gathered. Determine what new information you might need in order to solve this particular problem.

STEP 4—Brainstorming Solutions

List the solutions generated by your group discussion in the space below:

STEP 5—Evaluating Solutions

In this step, you decide which solutions might be most appropriate for solving the problem. To evaluate your solutions use the EVALUATION PROCESS FORM located on the next page. Decide on the top two solutions. Once you have used the EVALUATION GRID to determine your best solutions, discuss your results with the group to make sure that everyone agrees that this is the best solution.

Youth Summit Solution Evaluation Process

SOLUTIONS: Rank in order your top 2 solutions and list	**POSITIVE OUTCOMES +** List 3 positive outcomes for each solution	**NEGATIVE OUTCOMES -** List 3 negative outcomes for each solution	**POSSIBLE SHORT- & LONG-TERM CONSEQUENCES:** List the consequences that might result from the implementation of your solutions in a 1-, 5-, 10-, and 20-year time frame. Put a + or - by each consequence to signify whether it is positive or negative.			
SOLUTION #1:			**1 YEAR**	**5 YEARS**	**10 YEARS**	**20 YEARS**
SOLUTION #2:						

GROUP TOPIC:

GROUP MEMBERS:

SPECIFIC GROUP CHALLENGE:

Modifying Solutions

Once your group has determined the best solution to your issue, some modifications may be necessary. You may need to adjust your solution so that potential negative outcomes can be limited. To decide if you need to adjust your solution, answer the following questions:

1. What were some negative outcomes that could result from implementing your solution?

2. How could you avoid these negative possibilities?

3. Were there any possible negative short or long term consequences? If so, list these below.

4. Based upon the information to the above questions, how could you adjust your solution to minimize potential negative outcomes or consequences?

5. Write out your modified solution in the space provided below:

Congratulations! You should now have a well thought out solution to your group's selected problem.

STEP 6—Action Planning

You will now need to organize how to carry out your group's solution. Each of you will have individual tasks to complete. On the form below, write down your group action plan.

Youth Summit Group Action Plan Form

Group Topic:____________________________________

Group Members: (Please list first and last names.)

Describe the specific problem your group decided to solve:

List your best solution:

List the specific steps your group will take to carry out the solution, beginning with what you will do **first, second, third,** and so on. Also list the name of the group member who will be responsible for doing each step:

Create a timeline stating dates of completion for the steps listed above:

Describe the end result of your efforts. What exactly will you have accomplished?

Individual Commitment

On the following form, state the responsibilities you took on as part of your personal contribution toward solving a global problem.

Youth Summit Statement of Individual Commitment to Work on an Area of Global Concern

Name: ______________________________

Area of Global Concern:

List the commitments you made to your group at the Summit:

Please describe below any additional commitments you would like to make and pursue independently:

Signature: ______________________________ Date: ________

Thank you for your efforts to make the world a better place!

STEP 7—Presenting Group Solutions

Now that your group has determined a solution and an action plan, the next step in the Youth Summit process is to develop a presentation to inform others of your efforts. Your group should create a 5- to 15-minute presentation. To help organize your ideas, follow the steps below:

Step 1: Determine how you will inform the audience about your group's specific problem. What will you say or do to begin your presentation and how will you explain the issue?

Step 2: Outline below how you plan to describe your solution and action plan to the audience. Select at least two of the strategies listed below to include in your presentation.

Presentation Strategies:

- charts, graphs, tables
- posters
- illustrations, photographs
- cartoons
- poems, songs, raps
- skits, plays, simulations
- data sheets
- booklets, pamphlets, handouts
- overhead transparencies
- slides, video, music
- audience participation

Outline of your solution and the action plan portion of your presentation:

Step 3: If appropriate, how can your group engage the support of the audience in implementing your solution? List ways that your group could involve community members, business and industry, local schools, parents, and organizations who might give support. Prepare to share this as part of your presentation.

Summit Notes

Use this space to record information presented by the other groups. Be ready to write down what you can do to help solve the various problems presented.

Glossary

acid rain: the end product of the release of sulphur and nitrogen oxides into the atmosphere by electrical power plants, industry, and auto emissions. These chemicals are transformed into acids and fall back to Earth as rain, sleet and snow.

atmosphere: the air which surrounds the Earth. Scientists divide it into four layers called the troposphere, the stratosphere, the mesosphere and the exosphere. Pollution affects two parts of the atmosphere. In the lowest region, the troposphere, pollution affects the continents. Pollution in the upper region, the stratosphere, affects global weather.

biosphere: the region that spans from the Earth's crust to the atmosphere; supports self-sustaining ecological systems.

carbon dioxide (CO_2): a colorless, odorless gas formed during respiration, combustion (burning of fossil fuels), deforestation, and decomposition of plants and animals. Carbon dioxide is increasing the greenhouse effect.

carbon monoxide (CO): a colorless, odorless, highly poisonous gas formed by the incomplete combustion or burning, of carbon or carbonaceous material, including fossil fuels (mostly gas and diesel fuel) and vegetation.

cataracts: the clouding of the lens of the eye. Cataracts may cause blindness by spreading until the entire lens becomes opaque. Cataracts may be surgically removed.

chlorofluorocarbons (CFC's): chemicals used as propellants in aerosol sprays, refrigerants in air conditioners and freezers, and in the making of styrofoam. CFC's damage the protective ozone layer above the Earth.

conservation: protection of natural resources from waste or loss or harm.

defoliate: to cause the leaves of a tree or plant to fall off.

deforestation: the process of clearing forests through cutting or burning.

ecology: the study of the relationship between organisms and their environment.

ecosystem: a community of living species and their environment that function as an ecological unit in nature.

environment: the conditions that surround and influence living and non-living things.

extinction: the permanent loss of a species of plant or animal.

fossil fuels: substances derived from fossils such as coal, oil, wood and gas, that are used to make energy.

global: a term referring to the entire Earth; worldwide.

greenhouse effect: a phenomenon which naturally occurs when the atmosphere of the Earth traps heat from the sun, like the glass roof of a greenhouse. The atmosphere lets sunlight through to warm the surface of the Earth, while the heat that is created can not easily pass back through the atmosphere into space. This warming of the Earth allows life to exist. Scientists are predicting that the greenhouse effect is increasing due to human activities and that global temperatures may change dramatically as a result.

greenhouse gases: gases including carbon dioxide, methane, nitrous oxide, chlorofluorocarbons and gases that create ozone are increasing the greenhouse effect.

industry: the process of making raw materials into finished products for distribution.

incomplete combustion: this occurs when something burns without enough oxygen and therefore does not burn completely.

methane: a gas that is produced by fermentation in wet areas where oxygen is scarce, such as rice paddies, swamps, and the intestines of cattle and termites. This gas is contributing to global warming.

nitrogen oxides: gases from electrical power plants, industry, smeltering and automobiles that pollute the air.

nonrenewable resources: a valuable product from the environment such as coal and oil which can only be used once.

ozone: manmade ozone results from the combination of car exhaust and sunlight. Ozone pollution creates smog that damages plants, erodes buildings, and in humans, impairs breathing and irritates the eyes. Naturally occuring ozone in the ozone layer helps shield the Earth from the sun's harmful ultraviolet rays.

ozone layer: a thin layer of gas about 15 miles above the Earth that protects life from the harmful effects of the sun's ultraviolet rays. The ozone layer is being destroyed by chlorofluorocarbons, through the use of sprays, air conditioners, refrigerators, and solvents.

particulates: solid and liquid pollutants that exist as very small particles light enough to remain in the air. Some particulates include dust, soot, ash, metals such as lead and nickel, and mists and sprays.

pesticides: poisonous chemicals that are used to kill insects and rodents.

phytoplankton: small, floating ocean plants that are the basis of the food supply in the ocean. All sea animals feed on phytoplankton directly or indirectly.

pollutants: waste products.

pollution: the presence of substances that harm land, air and water.

recycling: the reuse of discarded materials to make new ones.

smeltering: a process that takes metals out of their original ore; usually done in large furnaces.

smog: a form of air pollution that can either be created from the combination of fog and smoke or from a condition caused by the interaction between sunlight and car exhaust fumes.

solvent: a liquid that dissolves another substance.

sulfur dioxide: a gas resulting from the burning of coal or other fuel containing large amounts of sulfur. It is poisonous and damages the lungs.

ultraviolet rays: an invisible form of light from the sun. Exposure to ultraviolet rays can cause skin cancer, damage the eyes, and harm plants and animals.

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OTHER RESOURCES:

Kids Against Pollution: an organization of 5th and 6th graders involved in a bimonthly letter writing campaign about pollution.
K.A.P.
Tenakill School
275 High Street
Closter, NJ 07624

Educating for a Global Future: a special double issue of *Breakthrough,* the publication of Global Education Associates.
Global Education Associates
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Kits: Global Awareness, Reach for Peace, Talking to Your Children, Understanding the Soviets, and Celebrating Peace.
Peace Links
Women Against Nuclear War
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Washington, DC 20003

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(303) 871-3106

Green Teacher
c/o Lisa Glick, Lifelab
809 Bay Avenue
Capitola, CA 95010 (focuses on environmental education)

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Model UN and youth program.
United Nations Association of the USA
485 Fifth Avenue
New York, New York 10017-6104
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Global Visions
International Newsletter
654 S. Stapely, Suite 122
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Global Tomorrow Coalition
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Mary Ellen Sweeney, Editor
Holistic Education Review Journal

About the Authors:

Linda MacRae-Campbell has a long and impressive track record in the field of education. For fifteen years, Linda taught grades K-12, and during that time was a three-time winner of the Teacher of the Year Award.

Her experience in education ranges from classroom teaching to such accomplishments as directing gifted, special ed., and arts programs for children; consulting for a variety of educational institutions; training teachers world wide and directing an international educational network in Seattle called New Horizons for Learning.

Linda is a nationally recognized expert in innovative educational research; she has given over one hundred presentations in the last three years.

Presently, she spends time, in addition to persuing a doctorate in education, as coordinator of a new model of teacher certification for Antioch University in Seattle, Washington.

* * *

Micki McKisson has an extensive background in education. She has been a classroom teacher, and an educational consultant for many years, a workshop facilitator and adjunct professor for Seattle Pacific University.

Micki has experience in coordinating and teaching a variety of educational programs involving U.S. and Brazilian students in Rio de Janeiro; working with youth at risk during five years of summer programs; and, for six years, teaching in the Gifted Education Program in Issaquah school district.

Currently, Micki works with Greenpeace International as North American Project Coordinator for the East/West Educational Project. She is also responsible for field-testing the Greenpeace curriculum in North America, Europe, and the Soviet Union.

Micki has a BA in Psychology and an MA in Systems Design—Education. Her previous book is titled *Chrysalis: Nurturing Creative and Independent Thought in Children.*

* * *

Together, Linda and Micki have developed and conducted the world's first Youth Summit in Moscow, where 200 Soviet and American youths worked together writing the Youth Declaration for the Future. They have also collaborated on teacher education programs for educators in Guatemala.

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